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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of	:	**Confirmation No. 3380**
Hiroyuki HAYASHIKAWA et al.	:	Docket No. 2002_0072A
Serial No. 10/048,226	:	Group Art Unit 2828
Filed May 13, 2002	:	Examiner T. Nguyen

LASER OSCILLATOR

APPELLANTS' BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

THE COMMISSIONER IS AUTHORIZED TO CHARGE ANY DEFICIENCY IN THE FEE FOR THIS PAPER TO DEPOSIT ACCOUNT NO. 23-0975.

Sir:

This is an appeal from the rejection of claims 8-13 and 15.

REAL PARTY IN INTEREST.

The real party in interest is Matsushita Electric Industrial Co., Ltd.

RELATED APPEALS AND INTERFERENCES.

There are no related appeals or interferences.

STATUS OF CLAIMS.

Claims 8-13 and 15 are pending in the application. Each of claims 8-13 and 15 is rejected.

STATUS OF AMENDMENTS.

An amendment attached hereto is effective to place claims 9 and 10 in better grammatical form and to cancel claims 1-7, which were previously withdrawn as being drawn to a non-elected invention.

SUMMARY OF THE INVENTION.

The present invention relates to a laser oscillator, and more particularly to an axial flow type gas laser oscillator (AFGLO) having a discharge tube disposed in the optical access direction.

As discussed on page 9, line 10 through page 10, line 5 of the present application, conventional axial flow gas laser oscillators are plagued with at least three problems.

As discussed on page 9, lines 11-18, with reference to Fig. 31, stress occurs in the parts of the resonator due to pressure difference between the laser gas circulation part and the outside at atmospheric pressure. By this stress, the discharge tube base 170 may be bent by about tens of μm. Since the discharge tube base 170 and a pair of mirror holders 150 are in unitary structure, if the discharge tube base 170 is bent only by tens of μm, the mutual angle of the pair of mirror holders 150a and 150b is varied. As a result, it was difficult to further enhance the stability of laser output.

As discussed in page 9, lines 19-23, the laser gas flow in the discharge tube tends to be not uniform in the central part or in peripheral part of the discharge tube. As a result, uniform gas flow is not realized, and the energy efficiency could not be further enhanced.

As discussed in page 9, line 23 through page 10, line 5, large rush current flows in the discharge tube at the discharge start moment when the voltage between the electrodes 2 and 3 reaches the discharge start voltage. When the rush current flows at the discharge start moment, a large current flows, and the discharge is temporarily disturbed. Accordingly, it takes some time for the discharge to stabilize, and the laser output is unstable during the unstable discharge period. This transient unstable period of discharge could not be shortened.

The inventors of the present invention have discovered that specific features and/or dimensions of a gas discharge tube provide unexpected and superior results over conventional discharge tubes and which solve the problems associated with the conventional axial flow gas laser oscillators as discussed above.

The present invention, as defined in independent claim 8 is directed to a laser oscillator comprising: a gas tube (for example, item 10 of FIG. 8) operable to pass laser gas inside thereof and to oscillate the laser gas; and a laser gas passage (for example, item 10 of FIG. 8) operable to supply the laser gas to said discharge tube, wherein the laser gas passage is connected to the discharge tube. More specifically, claim 8 requires a width B of the discharge tube in the direction normal to a gas flow direction in the laser gas passage near a connection portion of the discharge tube and the laser gas passage to be larger than an inner diameter A of the discharge tube. Claim 8 further requires that the relation $1.1A < B < 1.7A$ be satisfied (for example, as discussed on page 24, line 13 through page 25, line 21 with reference to FIGs. 9-11).

As discussed on page 25, lines 1-21, because of $1.1A < B < 1.7A$, a vortex in the laser gas flow at the discharge tube inlet 37 is avoided thereby providing a uniform gas flow distribution, which maximizes laser output.

The present invention as defined in claim 10, requires all of the elements of the invention as defined in claim 8, yet further requires a columnar protrusion (for example, item 38 of FIG. 12) to be provided to the discharge tube at a portion opposite to a connection of the discharge tube and the laser passage. Claim 10 further requires the following relations to be satisfied:

$1.1A < B < 1.7A$

$0.5A < C < 0.9A$

$0.7A < D < 0.9A$, and

wherein C is a height of the columnar protrusions from a center of the discharge tube, and D is a inner diameter of the columnar protrusion (for example, as discussed on page 25, line 22 through page 26, line 23 with reference to FIGs. 12 and 13).

As discussed on page 26, lines 4-13, a columnar protrusion (please note item 38 in Fig. 12) provided in the confronting part of the laser gas inlet of the discharge tube affects the laser gas flow so as to provide uniform gas flow distribution. As discussed on page 26, lines 14-23, because of: $1.1A < B < 1.7A$; $0.5A < C < 0.9A$; and $0.7A < D < 0.9A$, wherein C is a height of the columnar protrusions from a center of the discharge tube, and D is a inner diameter of the columnar protrusion, a vortex in the laser gas flow is avoided such that laser output is maximized.

The present invention as defined in claim 12, requires all of the elements of the invention as defined in claim 10, and further requires the columnar protrusion to be composed of dielectric materials (for example, as discussed on page 27, lines 11-17).

The present invention as defined in claim 9, is drawn to a laser oscillator comprising: a discharge tube (for example, item 10 of FIG. 8) operable to pass laser gas inside thereof and to excite the laser gas; and a laser gas passage (for example, item 10 of FIG. 8) operable to supply laser gas to the discharge tube, wherein the laser gas passage is connected to said discharge tube. Claim 9 further requires a columnar protrusion (for example, item 38 of FIG. 12) to be provided to the discharge tube, the columnar protrusion being provided at a portion opposite to a connection portion of the discharge tube and the laser gas passage. Still further, claim 9 requires the following relations to be satisfied:

$$0.5A < C < 0.9A$$

$$0.7A < D < 0.9A, \text{ and}$$

wherein A is an inner diameter of the discharge tube, C is a height of the columnar protrusion from a center of the discharge tube and D is a inner diameter of the columnar protrusion.

As discussed on page 26, line 24 through page 27, line 9 with reference to FIGs. 14 and 15, the required dimensional relationship between the discharge tube and the columnar protrusion additionally maximizes laser output.

The present invention as defined in claim 11 requires all of the elements of the invention as defined in claim 9, wherein the columnar protrusion is composed of dielectric materials (for example, as discussed on page 27, lines 11-17).

The present invention as defined in claim 13, is drawn to a laser oscillator comprising: a discharge tube (for example, item 1 of FIG. 20) having two ends and being operable to pass laser gas inside thereof and to excite the laser gas, the discharge tube being provided with a hole (for example, item 55 of FIG. 21) opened to an outside thereof; a laser gas passage (for example, item 10 of FIG. 20) operable to supply laser gas to the discharge tube, the laser gas passage being connected to the discharge tube; electrodes (for example, items 2 of FIG. 20) disposed at both ends of the discharge tube; a high voltage power supply (for example, item 4 of FIG. 20) operable to apply a high voltage

between the electrodes; and an auxiliary electrode (for example, item 56 of FIG. 21) covering the opened hole, the auxiliary electrodes being provided outside of the discharge tube. Claim 13 further requires the auxiliary electrode to be connected to one of the electrodes via a high resistance resistor (for example, item 58 of FIG. 21), and a distance between the hole and an electrode not connected with the auxiliary electrode to be between 0.4L and 0.7L, where L is a distance between the electrodes disposed at both ends of the discharge tube (for example, as discussed on page 29, line 4 through page 31, line 27).

As discussed on page 31, lines 18-20, (with respect to Fig. 22) when the distance between the hole and an electrode not connected with the auxiliary electrode is shorter than 0.4L, the ionized laser gas recombines, and the effect of reducing the discharge start voltage is not obtained. As discussed on page 31, lines 20-23, if the distance is longer than 0.7L, the distance between the positive electrode and the auxiliary electrode is too long, therefore the discharge start voltage increases. Accordingly, when a distance between the hole and an electrode not connected with the auxiliary electrode is between 0.4L and 0.7L, where L is a distance between the electrodes disposed at both ends of the discharge tube, the discharge start voltage is effectively reduced.

The present invention as defined in claim 15, requires all of the elements of the invention as defined in claim 13, wherein a resistance of the high resistance resistor is 1 MΩ or more and 100 MΩ or less.

As discussed on page 32, line 23 through page 33, line 1, if the resistance of the high resistance resistor is less than 1 MΩ, too much current flows in the auxiliary electrode and the discharge in the discharge area is disturbed. As a result, high laser output is not obtained. On the contrary, as discussed on page 33, line 1-6, if the resistance is larger than 100 MΩ, the effect of the auxiliary electrode is small, and the effect of decreasing the discharge start voltage is not obtained. Further, the discharge is disturbed by rush current, and the effect of increasing the laser output is not obtained. Therefore, when the high resistance resistor is 1 MΩ or more and 100 MΩ or less, a high laser output is obtained.

ISSUES.

The issues on Appeal are as follows:

I. Do claims 8 and 9 comply with 35 U.S.C. § 112, second paragraph?

II. Does claim 13 comply with 35 U.S.C. § 112, second paragraph?

III. Has the Examiner established a *prima facie* case of obviousness for rejecting claims 9-12 over either prior art Figures 25-33 or Hayashikawa, within the meaning of 35 U.S.C. § 103?

VI. Are each of claims 8-13 and 15 patentable over each of prior art Figures 25-33 and USPN 6,580,742 to Hayashikawa et al. (Hayashikawa), within the meaning of 35 U.S.C. § 103?

GROUPING OF CLAIMS.

Claims 10 and 12 stand or fall with claim 8.

Claim 11 stands or falls with claim 9.

Claim 15 stands or falls with claim 13

ARGUMENT

I. Each of claims 8 and 9 comply with 35 U.S.C. § 112, second paragraph.

Paragraph 5 of the Office Action asserts that, with respect to claims 8 and 9, there is "insufficient means, structure and functional relationship to conform a laser oscillator or the reason why the dimension range is significant, which render the claims vague and indefinite."

In light of MPEP § 2172.01, it is respectfully submitted that each of claims 8 and 9 provide sufficient structure and functional relationship to conform a laser oscillator. Specifically, each of claims 8 and 9 require a discharge tube and a laser gas passage. Furthermore, each of claims 8 and 9 specifically recite an interrelation of the discharge tube and the laser gas passage.

Paragraph 5 of the Office Action further indicates that it "is not clear if the equation is based on the designer choice or the equation is based on an experimental result, which render the claim vague and indefinite."

The second paragraph of 35 U.S.C. § 112 is directed to requirements for the claims. Specifically, the statute states as follows:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the Applicant regards as his invention. As discussed in MPEP § 2171, there are two separate requirements set forth for 35 U.S.C. § 112, second paragraph:
>
> (A) the claims must set forth the subject matter that the applicants regard as their invention; and
>
> (B) the claims must particularly point out and distinctly define the needs and bounds of the subject matter that will be protected by the patent grant.

As discussed in MPEP § 2172, a rejection based on the requirement that the claims must set forth the subject matter which applicants regard as their invention is appropriate only where applicant has stated, somewhere other than in the application as filed, that the invention if something different from what is defined by the claims. In the present application, it is respectfully submitted that the appellants have not stated that the invention is something different from what is defined by the claims. Accordingly, it is respectfully submitted that the claims fulfill the first requirement set forth in 35 U.S.C. § 112, second paragraph.

As discussed in MPEP § 2173, the primary purpose of the requirement that the claims must particularly point out and distinctly claim the invention is to ensure that the scope of the claims is clear so that the public is informed of the boundaries of what constitutes infringement of the patent. A secondary purpose is to provide a clear measure of what applicants regard as the invention so that it can be determined whether the claimed invention meets all of the criteria for patentability and whether the specification meets criteria of 35 U.S.C. § 112, first paragraph with respect to the claimed invention. In the present case, it is respectfully submitted that a person of ordinary skill in the art would understand and recognize the boundaries of what constitutes infringement of each of claims 8 and 9. Further, it is respectfully submitted that each of claims 8 and 9 provide a clear measure of what the appellants regard as the invention.

In light of the above discussion, it is respectfully submitted that the claims meet the second requirement for 35 U.S.C. § 112, second paragraph.

Contrary to the assertions in the Office Action, 35 U.S.C. § 112, second paragraph fails to require the claims to include a "reason why" a particular recited element "is significant." More specifically, compliance with 35 U.S.C. § 112, second paragraph fails to require an explanation of significance of a particular claim limitation. Nevertheless, it is respectfully submitted that the specification, for example as discussed above, provides a disclosure of significance of the recited limitations in each of claims 8 and 9.

Furthermore, 35 U.S.C. § 112, second paragraph fails to require the claims to clarify whether a particular element "is based on the designer choice" or is "based on an experimental result."

Appellants respectfully request that the examiner provide authority for the novel interpretations of 35 U.S.C. § 112, second paragraph, as asserted in the Office Action. Absent such authority, Appellants respectfully submit that each of claims 8 and 9 comply with 35 U.S.C. § 112, second paragraph for the reasons discussed above.

In light of the above discussion, Appellants respectfully request that the outstanding rejection of claims 8-12 under 35 U.S.C. § 112, second paragraph, be overturned.

II. Claim 13 complies with 35 U.S.C. § 112, second paragraph.

Paragraph 5 of the Office Action asserts that the "structural relationship of an electrode versus electrodes and auxiliary electrode," is vague and indefinite. Appellants respectfully traverse this assertion for the following reasons.

As discussed in MPEP § 2173.02, definiteness of claim language must be analyzed, not in a vacuum, but in light of:

A) the content of the particular application disclosure;
B) the teachings of the prior art; and
C) claim interpretation that will be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

It is respectfully submitted that a person of ordinary skill in the art at the time of the invention would readily understand the phrase "said auxiliary electrode is connected to one of said electrodes via a high resistance resistor, and a distance between the hole and an electrode not connected with said auxiliary electrode is between .4L and .7L." In particular, in light of items (A) and (C) discussed above with respect to MPEP § 2173.02, one of ordinary skill in the art at the time of the invention would understand that the claimed invention requires an auxiliary electrode that is connected to one of the electrodes and requires a distance between the hole and an electrode not connected with the auxiliary electrode to be between .4L and .7L. More specifically, it is respectfully submitted that the phrase "said auxiliary electrode is connected to one of said electrodes via a high resistance resistor, and a distance between the hole and an electrode not connected with said auxiliary electrode is between .4L and .7L," of claim 13 is clear and distinct such that the claim is in compliance with 35 U.S.C. § 112, second paragraph.

Furthermore, paragraph 5 of the Office Action asserts that it "is vague and indefinite as to the length of the hole and the electrode, there is a big difference between (ex. .4mm & .7mm vs. .4m and .7m), and it is not clear at the significant of the dimension range or 'its post solution', which render the claims vague and indefinite." Appellants respectfully traverse this assertion for the following reasons.

Contrary to the assertion by the Examiner, MPEP § 2173.04 clearly discusses that breadth of a claim is not to be equated with indefiniteness. It is respectfully submitted that the subject matter embraced by claims 13 and 15 is clear, and the appellants have not otherwise indicated that they intend the invention to be of a scope different from that defined in the claims. Accordingly, it is respectfully submitted that claims 13 and 15 comply with 35 U.S.C. § 112, second paragraph.

Appellants are unsure of the nexus between: the invention as recited in claims 13 and 15; the alleged non-compliance of claims 13 and 15 with 35 U.S.C. § 112, second paragraph; and the phrase "its post solution." Appellants are confident that if the Examiner is able to provide such a nexus, Appellants will be able to provide a convincing discussion that claims 13 and 15 nevertheless comply with 35 U.S.C. § 112, second paragraph.

In light of the above discussion, Appellants respectfully request that the outstanding rejection of claims 13 and 15 under 35 U.S.C. § 112, second paragraph, be overturned.

III. The Examiner has failed to establish a *prima facie* case of obviousness for rejecting claims 9-12 over either prior art Figures 25-33 or Hayashikawa, within the meaning of 35 U.S.C. § 103.

Each of claims 9-12 require *inter alia*, a "**columnar protrusion**."

In paragraphs 2 and 8 of the Office Action, the Examiner has cited both the prior art Figures 25-33 and Hayashikawa as evidence of obviousness of appellants' invention defined in claims 9-12. Each reference has been separately applied against the claims. The Examiner has not acknowledged the "columnar protrusion" limitations in appellants' claims, discussed the differences between the prior art cited and the claimed subject matter, or provided evidence or logical scientific reasoning to indicate why, despite differences between the subject matter claimed by appellants and that disclosed by each reference, the invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made.

35 U.S.C. § 103 authorizes the Patent and Trademark Office to refuse granting of a patent:

> "if **the differences between** the subject matter sought to be patented and the prior art are such that the **subject matter as a whole would have been obvious** at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains."(Emphasis added.)

The underlined portion of the statute, coupled with the language in 35 U.S.C. § 102 that "a person **shall be entitled** to a patent unless (emphasis added) places a heavy burden on any Examiner seeking to reject the claims of a patent application for obviousness, for it is the task of the patent Examiner to produce the factual basis for a rejection under 35 U.S.C. § 103. *In re Warner*, 379 F. 2d 1011, 154 USPQ 173 (CCPA 1967).

To safeguard the rights of patent Applicants and prevent perfunctory dismissal of patent claims, Congress and the Patent and Trademark Office have enacted statutes or rules and procedures which must be followed in the examination process.

35 U.S.C. § 132 mandates the Patent and Trademark Office, whenever rejecting any claim for a patent to:

> "notify the applicant thereof, **stating the reasons** for such rejection ... together with such **information and references** as may be useful in judging of the propriety of continuing the prosecution of his application." (Emphasis added.)

Section 706.02(j) of the Manual of Patent Examining Procedure Instructs:

> "[a]fter indicating that the rejection is under 35 U.S.C. § 103, the examiner should set forth in the Office action: (A) the relevant teachings of the prior art relied upon, preferably with reference to the relevant column or page number(s) and line number(s) where appropriate, (B) the difference or differences in the claim over the applied reference(s), (C) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter, and (3) **an explanation why** one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification." (Emphasis added.)

As a matter of Patent and Trademark Office practice, then, due process under 35 U.S.C. § 132 **requires** an Examiner, whenever rejecting a claim under 35 U.S.C. § 103, to include in his official action, (1) a statement regarding the features of the invention set forth in Applicants' claims; (2) a comparison of the claimed features of the invention with the closest prior art reference or references; (3) an explanation of **why** the **differences** between the features of an Applicants' claimed invention and the closest counterparts in the prior art are such that the claimed invention as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made, and (4) sub-stantiation of that explanation with either evidence in the form of prior art references or sound scientific reasoning such that one may take official notice of it. See, for example, *In re Hughes*, 345 F.2d 184, 145 USPQ 467 (CCPA 1965); *In re Soli*, 317 F.2d 941, 137 USPQ 797 (CCPA 1963).

In the present case, the rejections are under 35 U.S.C. § 103, and each of the references show or describe inventions **other** than the claimed invention, i.e., they do not disclose the required "columnar protrusion." The Examiner has not noted the differences and has not explained **why**, despite the differences, the invention as a whole would have been obvious to one of ordinary skill at

the time the invention was made. In the absence of an explanation supported by specific factual findings based on evidence or sound scientific reasoning, it is asserted that the rejection is merely conclusory in nature.

In light of the above discussion, it is respectfully requested that the outstanding rejections of claims 9-12 under 35 U.S.C. § 103, over prior art Figures 25-33 and the outstanding rejections of claims 9-12 under 35 U.S.C. § 103, over Hayashikawa be reversed.

IV. Each of claims 8-13 and 15 are patentable over prior art Figures 25-33 and Hayashikawa, within the meaning of 35 U.S.C. § 103.

Claim 8 is drawn to a laser oscillator comprising, *inter alia*, a discharge tube and a laser gas passage connected to the discharge tube. Further, claim 8 requires **a width B of the discharge tube in a direction normal to a gas flow direction in the laser gas passage near a connection portion of the discharge tube and the laser gas passage to be larger than an inner diameter A of the discharge tube**. Still further, claim 8 requires the relation **1.1A < B < 1.7A** to be satisfied. (Emphasis added).

Claim 9 is drawn to a laser oscillator comprising, *inter alia*, a discharge tube and a laser gas passage connected to the discharge tube. Further, claim 9 requires a columnar protrusion to be provided to the discharge tube at a portion opposite to a connection portion of the discharge tube and the laser gas passage. Still further, claim 9 requires the relations **0.5A < C < 0.9A and 0.7A < D < 0.9A to be satisfied, wherein A is an inner diameter of the discharge tube, C is a height of the columnar protrusion from a center of the discharge tube and D is an inner diameter of the columnar protrusion**. (Emphasis added).

Claim 13 is drawn to a laser oscillator comprising, *inter alia*, a discharge tube, a laser gas passage, electrodes, a high voltage power supply and an auxiliary electrode. More specifically, claim 13 requires **a distance between the hole and an electrode not connected with the auxiliary electrode to be between 0.4L and 0.7L, where L is the distance between the electrodes disposed at both ends of said discharge tube**. (Emphasis added).

It is respectfully submitted that each of Figures 25-33 and Hayashikawa fails to teach the above-emphasized limitations. In light of the fact that claims 8-13 and 15 are rejected under 35 U.S.C. § 103, and in light of the reliance on *In re Aller*, 105 USPQ 233 (as discussed in paragraphs 7 and 8 of the Office Action), it is respectfully submitted that the examiner concedes that neither Figures 25-33 nor Hayashikawa teaches the above-emphasized limitations.

Contrary to the assertions in the Office Action, it is respectfully submitted that claims 8-13 and 15 are patentable over Figures 25-33 and Hayashikawa, within the meaning of 35 U.S.C. § 103, for the following reasons.

Each of paragraphs 7 and 8 of the Office Action asserts that discovering "the optimum or workable ranges of resistor or of length, width, height of the discharge tube and gas passage to improve its flow dynamic to fit the laser oscillator, involves only routine skill in the art."

MPEP § 2144.05 (II)(B) specifically indicates that a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. *In re Antonie*, 559 F.2d 618 at 620,195 USPQ 6 at 8-9 (CCPA 1977) (stating that a *prima facie* case of obviousness may be rebutted where, "the result of optimizing a variable, **which was known to be result effective**, [are] unexpectedly good.").

Although the Office Action asserts that discovering "the optimum or workable ranges of resistance or of length, width, height of the discharge tube and gas passage to improve its flow dynamic to fit the laser oscillator, involves only routine skill in the art," such an assertion incorrectly presumes that any one of the recited dimensions of the discharge tube, the recited dimensions of the columnar protrusion and the recited displacement of the electrodes was known to be result effective. **There is no suggestion in either one of prior art Figures 25-33 or Hayashikawa to support this presumption**.

In the present case, no evidence presented in the record, other than the Appellants' own disclosure, teaches that a relationship of the width of the discharge tube to the inner diameter of the discharge tube, as required in independent claim 8, affects laser output. As discussed on page 25, lines 1-21 of the present specification, the applicants have determined that the recited dimensions

prevent a vortex in the laser gas flow from forming thereby provide a uniform gas flow distribution, which maximizes laser output.

Further, no evidence presented in the record, other than the Appellants' own disclosure, teaches that the relationship between the inner diameter of the discharge tube, the height of the columnar protrusion from the center of the discharge tube and the inner diameter of the columnar protrusion, as required in independent claim 9, affects the laser output. As discussed on page 26, line 24 through page 27, line 9 of the present application, the required dimension of relationship between the discharge tube and the columnar protrusion additionally maximizes laser output.

Finally, no evidence presented in the record, other than the Appellants' own disclosure, teaches that the distance between the electrodes disposed between the two ends of the discharge tube, as required in independent claim 13 affects the laser output. As discussed on page 31, lines 18-20 of the present application, the displacement of the electrodes as recited in the present invention the discharge start voltage is minimized.

In the words of *Antonie*, and in the absence of evidence presented in the record to the contrary, it is respectfully submitted that neither one of: the relationship between width of the discharge tube to the inner diameter of the discharge tube, as required in claim 8, the relationship of the height of the columnar protrusion from the center of the discharge tube to the inner diameter of the columnar protrusion, as required in claim 9; or the distance between the electrodes disposed at both ends of the discharge tube, as required in claim 13 "was known to be result effective" with respect to the output of the laser.

Because neither one of: the relationship between width of the discharge tube to the inner diameter of the discharge tube, as required in claim 8, the relationship of the height of the columnar protrusion from the center of the discharge tube to the inner diameter of the columnar protrusion, as required in claim 9; or the distance between the electrodes disposed at both ends of the discharge tube, as required in claim 13 "was known to be result effective" with respect to the output of the laser, it is respectfully submitted that the Examiner's reliance on *In re Aller* is inappropriate. More importantly, it is respectfully submitted that the Examiner's assertions of optimization are unfounded.

In light of the above discussion, it is respectfully submitted that it would not have been obvious to modify either that which is illustrated in Figs. 25-33 or Hayashikawa to arrive at the present invention. Accordingly, it is respectfully requested that the rejection of claims 8-13 and 15 under 35 U.S.C. § 103 over Figures 25-33, be reversed.

APPENDIX

A copy of the claims on appeal is set forth in an Appendix immediately following the conclusion and signature, and is incorporated herein by reference.

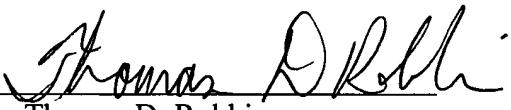
CONCLUSION

In view of the above, it is apparent that the prior art references, taken alone or in combination, fail to disclose or suggest the above claims in combination. Therefore, for the reasons stated above, the Examiner's decision to finally reject claims 8-13 and 15 should be reversed.

This brief is submitted in triplicate.

Respectfully submitted,

Hiroyuki HAYASHIKAWA et al.

By 

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APPENDIX - Claims on Appeal

Claims 1-7 **(Cancelled)**

8. A laser oscillator comprising:

a discharge tube operable to pass laser gas inside thereof and to excite the laser gas; and

a laser gas passage operable to supply the laser gas to said discharge tube, said laser gas passage being connected to said discharge tube,

wherein a width B of said discharge tube in a direction normal to a gas flow direction in said laser gas passage near a connection portion of said discharge tube and said laser gas passage is larger than an inner diameter A of said discharge tube, and a following relation is satisfied

$1.1A < B < 1.7A$

9. A laser oscillator comprising:

a discharge tube operable to pass laser gas inside thereof and to excite the laser gas; and

a laser gas passage operable to supply laser gas to said discharge tube, said laser gas passage being connected to said discharge tube,

wherein a columnar protrusion is provided to said discharge tube, said columnar protrusion being provided at a portion opposite to a connection portion of said discharge tube and said laser gas passage,

wherein the following relations are satisfied

$0.5A < C < 0.9A$

$0.7A < D < 0.9A$, and

wherein A is an inner diameter of said discharge tube, C is a height of said columnar protrusion from a center of said discharge tube and D is a inner diameter of said columnar protrusion.

10. The laser oscillator of claim 8, further comprising:

a columnar protrusion being provided to said discharge tube at a portion opposite to a connection portion of said discharge tube and said laser passage,

wherein the following relations are satisfied

$1.1A < B < 1.7A$

$0.5A < C < 0.9A$

$0.7A < D < 0.9A$, and

wherein C is a height of said columnar protrusions from a center of said discharge tube, and D is an inner diameter of said columnar protrusion.

11. The laser oscillator of claim 9, wherein said columnar protrusion is composed of dielectric materials.

12. The laser oscillator of claim 10, wherein said columnar protrusion is composed of dielectric materials.

13. A laser oscillator comprising:

a discharge tube having two ends and being operable to pass laser gas inside thereof and to excite the laser gas, said discharge tube being provided with a hole opened to an outside thereof;

a laser gas passage operable to supply laser gas to said discharge tube, said laser gas passage being connected to said discharge tube;

electrodes disposed at both ends of said discharge tube;

a high voltage power supply operable to apply a high voltage between said electrodes; and

an auxiliary electrode covering the opened hole, said auxiliary electrodes being provided outside of said discharge tube,

wherein said auxiliary electrode is connected to one of said electrodes via a high resistance resistor, and a distance between the hole and an electrode not connected with said auxiliary electrode is between 0.4L and 0.7L, where L is a distance between said electrodes disposed at both ends of said discharge tube.

14. (Cancelled)

15. The laser oscillator of claim 13, wherein a resistance of said high resistance resistor is 1 MΩ or more and 100 MΩ or less.